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(54) **PROCESSING DATA**

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Jan. 17, 2014	(GB)	1400841.1

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CPC ***H04L 63/08*** (2013.01)

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CPC H04L 63/08
USPC 726/4; 455/435.1
See application file for complete search history.

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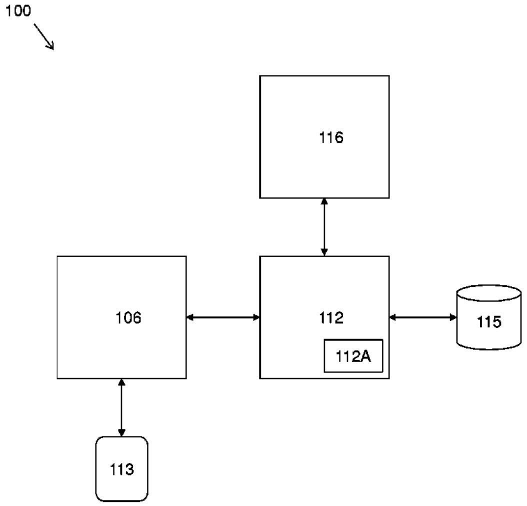
(57) **ABSTRACT**

At a network node separate from a subscriber configuration network node configured to store subscriber configuration data for a plurality of subscriber devices, a request to access configuration data associated with a subscriber stored at the subscriber configuration network node is received. In response to the received access request comprising a private user identity for the subscriber, but not a public user identity for the subscriber, the network node retrieves, from a user identity database configured to store user identity data for identifying subscribers in the network, a public user identity for the subscriber, the retrieval being carried out on the basis of the private user identity for the subscriber comprised in the received access request, and transmits an authorization request to the subscriber configuration network node comprising the public user identity retrieved from the user identity database and the private user identity comprised in the received access request.

18 Claims, 3 Drawing Sheets



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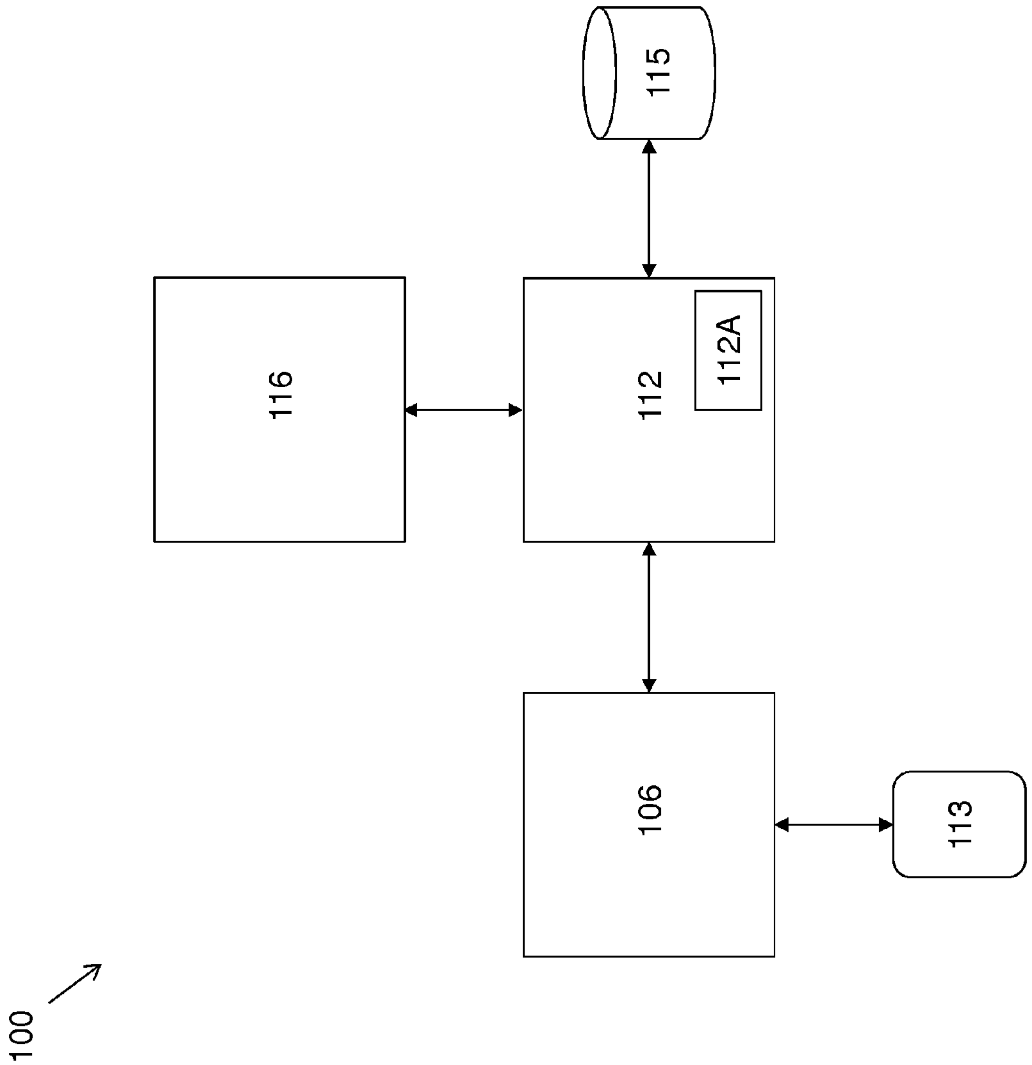

FIG. 1

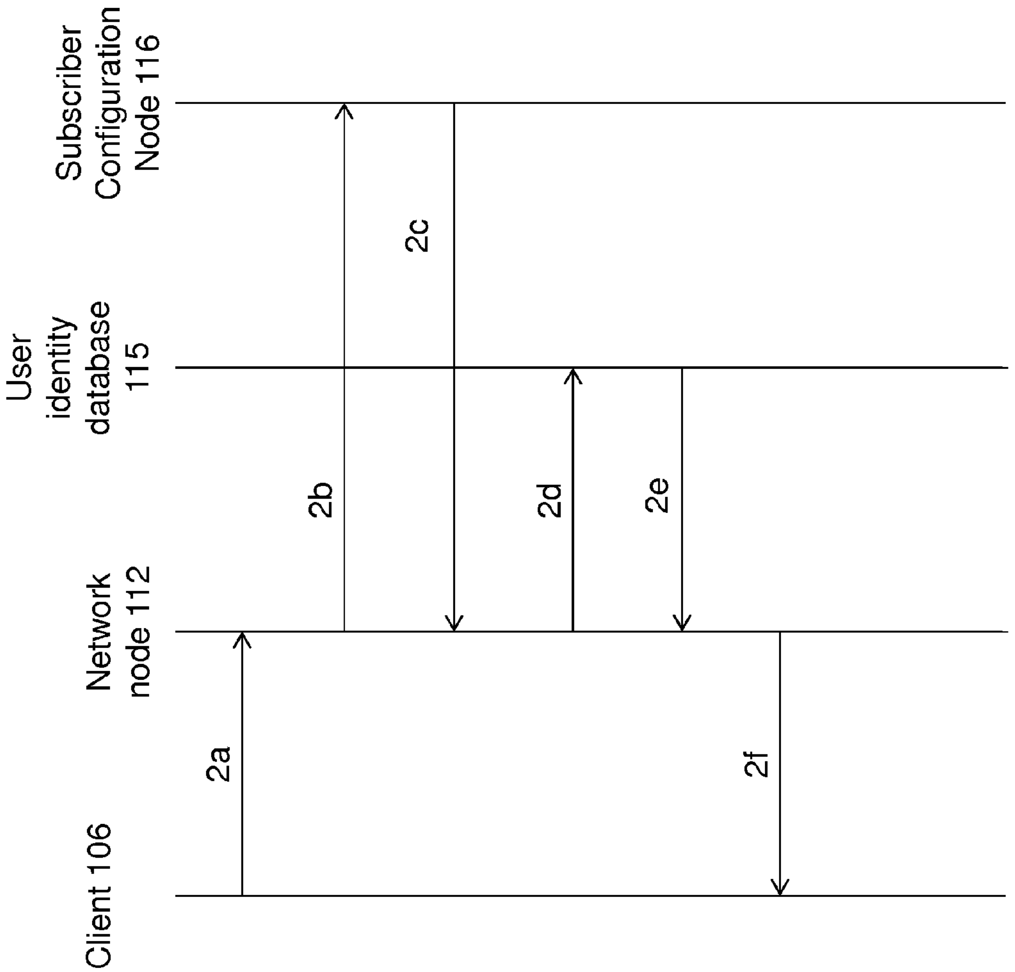
Client 106
Network node 112
User identity database 115
Subscriber Configuration Node 116
2a
2b
2c
2d
2e
2f

FIG. 2

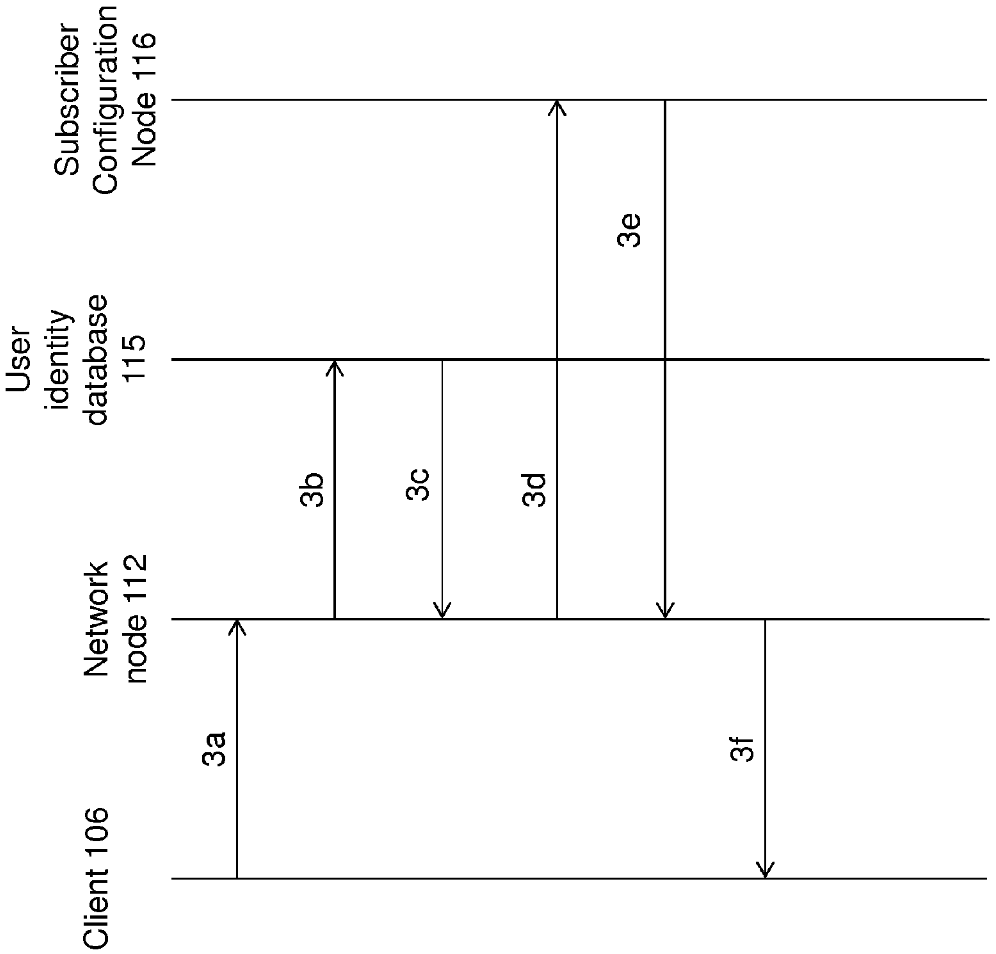
Client 106
Network node 112
User identity database 115
Subscriber Configuration Node 116
3a
3b
3c
3d
3e
3f

FIG. 3

PROCESSING DATA

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 U.S.C. §119(a) to (1) UK patent application no. GB1307811.8, filed Apr. 30, 2013; (2) UK patent application no. GB 1308080.9, filed May 3, 2013; (3) UK patent application no. GB 1308078.3, filed May 3, 2013; and (4) UK patent application no. GB 1400841.1, filed Jan. 17, 2014. Each of the above-referenced patent applications is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

The present disclosure relates to processing data. In particular, but not exclusively, the present disclosure relates to measures, including methods, apparatus and computer program products, for processing data in a telecommunications network.

BACKGROUND

Internet Protocol Multimedia System (IMS) networks have the concept of both public and private user identities. Public user identities are how one phone user (or 'subscriber') is identified by other phone users, for example when making a call, one user provides the public user identity of the other user they want to call. Private user identities are how the user identifies themselves to the core of the network; in particular, they can for example be used for authentication. Different types of subscriber data are associated with public user identities from private user identities, for example authentication credentials can be stored at the scope of a private user identity, as opposed to a public user identity.

The IMS architecture proposes a Home Subscriber Server (HSS) component, which stores this subscriber data and exposes it over a Cx interface. Authentication credentials can be retrieved from the HSS by using a Cx Multimedia-Auth-Request/Answer flow. This flow requires both a public and a private user identity to be provided, even though the underlying data is stored only at the scope of a private user identity.

SUMMARY

According to first embodiments, there is a method of processing data in a telecommunications network, the network comprising:

a subscriber configuration network node configured to store subscriber configuration data for a plurality of subscriber devices; and

a user identity database configured to store user identity data for identifying subscribers in the network,

the method comprising, at a network node separate from the subscriber configuration network node:

receiving a request to access configuration data associated with a subscriber stored at the subscriber configuration network node;

in response to the received access request comprising a private user identity for the subscriber, but not a public user identity for the subscriber:

retrieving, from the user identity database, a public user identity for the subscriber, the retrieval being carried out on the basis of the private user identity for the subscriber comprised in the received access request; and

transmitting an authorization request to the subscriber configuration network node comprising the public user identity retrieved from the user identity database and the private user identity comprised in the received access request.

According to second embodiments, there is apparatus for use in processing data in a telecommunications network, the network comprising:

a subscriber configuration network node configured to store subscriber configuration data for a plurality of subscriber devices; and

a user identity database configured to store user identity data for identifying subscribers in the network,

the apparatus comprising a network node separate from the subscriber configuration network node, the apparatus comprising at least one processor, and at least one memory including computer program code, the at least one memory and the computer program code being configured to, with the at least one processor, cause the apparatus at least to:

receive a request to access configuration data associated with a subscriber from the subscriber configuration network node;

in response to the received access request comprising a private user identity for the subscriber, but not a public user identity for the subscriber:

retrieve, from the user identity database, a public user identity for the subscriber, the retrieval being carried out on the basis of the private user identity for the subscriber comprised in the received access request; and

transmit an authorization request to the subscriber configuration network node comprising the public user identity retrieved from the user identity database and the private user identity comprised in the received access request.

According to third embodiments, there is a computer program product comprising a non-transitory computer-readable storage medium having computer readable instructions stored thereon, the computer readable instructions being executable by a computerized device to cause the computerized device to perform a method for processing data in a telecommunications network, the network comprising:

a subscriber configuration network node configured to store subscriber configuration data for a plurality of subscriber devices; and

a user identity database configured to store user identity data for identifying subscribers in the network,

the method comprising, at a network node separate from the subscriber configuration network node:

receiving a request to access configuration data associated with a subscriber from the subscriber configuration network node;

in response to the received access request comprising a private user identity for the subscriber, but not a public user identity for the subscriber:

retrieving, from the user identity database, a public user identity for the subscriber, the retrieval being carried out on the basis of the private user identity for the subscriber comprised in the received access request; and

transmitting an authorization request to the subscriber configuration network node comprising the public user identity retrieved from the user identity database and the private user identity comprised in the received access request.

Further features of embodiments will become apparent from the following description of preferred embodiments, given by way of example only, which is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows an example telecommunications network in which embodiments of the present disclosure may be practiced;

FIG. **2** shows a flow diagram according to embodiments; and

FIG. **3** shows a flow diagram according to embodiments.

DETAILED DESCRIPTION

FIG. **1** shows an example telecommunications network in which embodiments of the present disclosure may be practiced. Telecommunications network **100** comprises a client device (or node) **106**, a subscriber configuration network node **116**, a network node **112**, and a user identity database **115**.

Network node **112** comprises one or more processors and/or one or more memories **112**A for performing various data processing tasks according to embodiments. Network node **112** is separate to subscriber configuration network node **116**, but is configured to communicate with subscriber configuration network node **116**, client device **106** and user identity database **115**. In some embodiments, user identity database **115** is located separately to network node **112** and in other embodiments, user identity database **115** is located integrally to network node **112**.

Subscriber configuration network node **116** is responsible for storing subscriber configuration data for subscriber devices in telecommunications network **100**.

Client device **106** may comprise a subscriber device or a network node which is configured to communicate with network node **112**, for example to transmit access requests to network node **112**. In some embodiments, client device **106** comprises a network node from a cluster of network nodes responsible for conducting registration procedures for subscriber devices (such as subscriber device **113** which may for example comprise a cellular telephone) and/or processing routing data relating to communication sessions conducted in the network.

Embodiments comprise a network node (or 'component' or 'element') **112** which is configured to cache user identities in user identity database **115**. In embodiments network node **112** presents a REST-ful HTTP interface based on an (IMS standard) Cx interface. In IMS, data is either associated with a public user identity or a private user identity (but not both). However, the Cx interface requires both to be provided on requests. Users of the HTTP interface don't always have both identities, so in embodiments, network node **112** caches the mapping between these identities so that it can build Cx interface requests even when one identity is absent.

Embodiments comprise caching the mapping from private user identity to public user identity so that network node **112** is able to construct a suitable authorization request (for example a Multimedia-Auth-Request) for transmittal to subscriber configuration network node **116** based on just a private user identity.

Embodiments comprise measures, including methods, apparatus and/or computer program products for use in processing data in telecommunications network **100**. In embodiments, the network comprises subscriber configuration network node **116** configured to store subscriber configuration data for a plurality of subscriber devices, and user identity database **115** configured to store user identity data for identifying subscribers in the network.

In embodiments a request to access configuration data associated with a subscriber from subscriber configuration network node **116** is received at network node **112** separate from subscriber configuration network node **116**. The access request may have been triggered by a Session Initiation Protocol (SIP) REGISTER event, for example in relation to subscriber device **113** attempting to register with the network. The access request may comprise a SIP digest authentication request.

In embodiments, in response to the received access request comprising a public user identity (for example public@example.com) and a private user identity (for example private@example.com) for the subscriber, network node **112** transmits an authorization request to subscriber configuration network node **116** comprising the public user identity and the private user identity for the subscriber.

In other embodiments, in response to the received access request comprising a private user identity for the subscriber, but not a public user identity for the subscriber, network node **112** retrieves, from user identity database **115**, a public user identity for the subscriber, where the retrieval is carried out on the basis of the private user identity for the subscriber comprised in the received access request; in such embodiments, network node **112** then transmits an authorization request to subscriber configuration network node **116** comprising the public user identity retrieved from the user identity database and the private user identity comprised in the received access request.

In embodiments, the user identity database comprises a cache configured to store mappings between public and private user identities associated with subscribers. In such embodiments network node **112**, prior to receipt of the access request, caches a mapping between the public user identity and the private user identity for the subscriber in user identity database **115**. In embodiments, the mapping is cached in relation to a previous access request for the subscriber received at the separate network node **112**.

In embodiments, multiple public user identities map to the same private user identity. Any valid public user identity can be acceptable in an authorization request such as a Multimedia-Auth-Request message, so in embodiments the most recently-used public user identity for each private user identity is employed.

In embodiments, in response to transmittal of the authorization request, network node **112** receives a successful authentication response from subscriber configuration network node **116**. In embodiments, in response to receipt of the successful authentication response from the subscriber configuration network node, network node **112** updates the cached mapping between the public user identity and the private user identity for the subscriber in user identity database **115**.

In embodiments, network node **112** receives the requested configuration data for the subscriber from subscriber configuration network node **116**. In embodiments, the access request was received from client device **106** in the network, and network node **112** transmits the configuration data for the subscriber received from subscriber configuration network node **116** to client device **106**.

In some embodiments, the access request comprises a public user identity for the subscriber and a private user identity for the subscriber and is associated with a SIP flow. In other embodiments, the access request comprises a private user identity for the subscriber, but not a public user identity for the subscriber and is associated with a Traversal Using Relay Network Address Translation (TURN) flow. Note that in some embodiments, different devices/nodes may handle SIP flows than those which handle TURN flows.

In embodiments, telecommunications network **100** comprises an IMS network and subscriber configuration network node **116** comprises an HSS.

In embodiments, the authorization request is transmitted to and/or the successful authentication response is received via an IMS Cx interface of the separate network node.

In embodiments, the access request is received via a Hypertext Transfer Protocol (HTTP) interface of the separate network node. The HTTP interface may for example comprise a Representational State Transfer (REST)-ful HTTP Application Programming Interface (API).

In embodiments, network node **112** exposes two REST-ful HTTP APIs for retrieving authentication credentials—one that provides both the public user identity and the private user identity, and one that just provides the private user identity. Client device **106** uses the interface that includes both user identities if it has both available, and uses the interface that only includes the private user identity if that is all it has.

In embodiments, the separate network node comprises a first Representational State Transfer (REST)-ful HTTP Application Programming Interface (API) configured to accept a first type of access request comprising a public user identity and a private user identity for a given subscriber, and a second Representational State Transfer (REST)-ful HTTP Application Programming Interface (API) configured to accept a second type of access request comprising a public user identity, but not a private user identity for a given subscriber.

If for example network node **112** receives a REST-ful HTTP API request with both the public user identity and the private user identity, it constructs a Multimedia-Auth-Request message containing both these identities for transmittal to subscriber configuration network node **116**. If network node **112** receives a REST-ful HTTP API request with just the private user identity, it looks up the corresponding public user identity in user identity database **115** and then constructs a Multimedia-Auth-Request message using this public user identity and the provided private user identity for transmittal to the subscriber configuration network node **116**.

FIG. **2** shows a flow diagram according to embodiments. In step **2***a*, client device **106** transmits to network node **112** a request to access configuration data associated with a subscriber from subscriber configuration network node **116**. The access request of step **2***a* comprises a public user identity and a private user identity for the subscriber. In step **2***b*, in response to receipt of the access request comprising a public user identity and a private user identity for the subscriber of step **2***a*, network node **112** transmits an authorization request to subscriber configuration network node **116** comprising the public user identity and the private user identity for the subscriber. Subscriber configuration node **116** authorises the access request on the basis of the public user identity and a private user identity for the subscriber comprised in the authorization request of step **2***b* and transmits a successful authentication response to network node **112** in step **2***c*. In embodiments, the configuration data requested by client **106** in access request **2***a* is transmitted to network node **112** in conjunction with the successful authentication response of step **2***c*.

In step **2***d*, network node **112** caches a mapping between the public user identity and the private user identity for the subscriber in user identity database **115**; if there was already a mapping between the public user identity and the private user identity for the subscriber stored in user identity database **115**, then this caching updates the existing mapping stored in user identity database **115**. User identity database **115** confirms the caching of step **2***d* to network node **112** in step **2***e*. In step **2***f*, network node **112** transmits the configuration data for the subscriber received from subscriber configuration node **116** to client **106**.

In the embodiments of FIG. **2** described above, step **2***f* is depicted as occurring after steps **2***d* and **2***e*. In alternative embodiments, step **2***f* is carried out before one or more of steps **2***d* and **2***e*. Such embodiments may provide improved latency.

FIG. **3** shows a flow diagram according to embodiments. In step **3***a*, client device **106** transmits to network node **112** a request to access configuration data associated with a subscriber from subscriber configuration network node **116**. The access request of step **3***a* comprises a private user identity for the subscriber, but not a public user identity for the subscriber. In steps **3***b* and **3***c*, in response to receipt of the access request comprising a private user identity for the subscriber, but not a public user identity for the subscriber of step **3***a*, network node **112** retrieves, from user identity database **115**, a public user identity for the subscriber; the retrieval is carried out on the basis of the private user identity for the subscriber comprised in the received access request of step **3***a*. In step **3***d*, network node **112**, transmits an authorization request to subscriber configuration network node **116** comprising the public user identity retrieved from user identity database **115** in steps **3***b* and **3***c* and the private user identity comprised in the received access request of step **3***a*.

Subscriber configuration node **116** authorises the access request on the basis of the public user identity and a private user identity for the subscriber comprised in the authorization request of step **3***d* and transmits a successful authentication response to separate node **112** in step **3***e*. In embodiments, the configuration data requested by client **106** in access request **3***a* is transmitted to network node **112** in conjunction with the successful authentication response of step **3***e*. In step **3***f*, network node **112** transmits the configuration data for the subscriber received from subscriber configuration node **116** to client **106**.

In embodiments, in response to step **3***e*, network node **112** caches (not shown) a mapping between the public user identity and the private user identity for the subscriber in user identity database **115**; if there was already a mapping between the public user identity and the private user identity for the subscriber stored in user identity database **115**, then this caching updates the existing mapping stored in user identity database **115**. In embodiments, user identity database **115** confirms (not shown) this caching to network node **112**.

Embodiments comprise a method of processing data in a telecommunications network, the network comprising:

a subscriber configuration network node configured to store subscriber configuration data for a plurality of subscriber devices; and

a user identity database configured to store user identity data for identifying subscribers in the network, the method comprising, at a network node separate from the subscriber configuration network node:

receiving a request to access configuration data associated with a subscriber from the subscriber configuration network node, the received access request comprising a private user identity for the subscriber, but not a public user identity for the subscriber;

retrieving, from the user identity database, a public user identity for the subscriber, the retrieval being carried out on the basis of the private user identity for the subscriber comprised in the received access request; and

transmitting an authorization request to the subscriber configuration network node comprising the public user identity retrieved from the user identity database and the private user identity comprised in the received access request.

The above embodiments are to be understood as illustrative examples of the present disclosure. Further embodiments of the present disclosure are envisaged.

In alternative embodiments, client device **106** communicates directly with user identity database **115**. In some such embodiments both public and private user identities are provided to network node **112**. In some such embodiments both public and private user identities are always provided to network node **112**.

It is to be understood that any feature described in relation to any one embodiment may be used alone, or in combination with other features described, and may also be used in combination with one or more features of any other of the embodiments, or any combination of any other of the embodiments. Furthermore, equivalents and modifications not described above may also be employed without departing from the scope of the present disclosure, which is defined in the accompanying claims.

What is claimed is:

1. A method of constructing authorization requests in a telecommunications network, the method comprising:

receiving, at a network node separate from a subscriber configuration network node, a request to access configuration data associated with a subscriber stored at the subscriber configuration network node wherein the received access request comprises a private user identity for the subscriber, but not a public user identity for the subscriber, and wherein the subscriber configuration network node is configured to store subscriber configuration data for a plurality of subscriber devices;

retrieving, at the network node separate from the subscriber configuration network node, in response to the received access request, a public user identity for the subscriber from a user identity database configured to store user identity data for identifying subscribers in the telecommunications network, the retrieval of the public user identity being carried out based on the private user identity for the subscriber included in the received access request, wherein the user identity database is separate from the subscriber configuration network node; and

transmitting, at the network node separate from the subscriber configuration network node, an authorization request to the subscriber configuration network node, wherein the transmitted authorization request comprises the public user identity retrieved from the user identity database and the private user identity comprised in the received access request.

2. The method of claim **1**, further comprising:

transmitting in response to the received access request, an authorization request to the subscriber configuration network node, wherein the transmitted authorization request includes the public user identity and the private user identity for the subscriber.

3. The method of claim **1**, wherein the user identity database comprises a cache configured to store mappings between public and private user identities associated with subscribers, and wherein the method further comprises caching, prior to receipt of the access request, a mapping between the public user identity and the private user identity for the subscriber in the user identity database.

4. The method of claim **3**, wherein the mapping is cached in relation to a previous access request for the subscriber received at the separate network node.

5. The method of claim **1**, further comprising:

receiving, in response to transmittal of the transmitted authorization request, a successful authentication response from the subscriber configuration network node.

6. The method of claim **5**, further comprising:

updating, in response to receipt of the successful authentication response from the subscriber configuration network node, the cached mapping between the public user identity and the private user identity for the subscriber in the user identity database.

7. The method of claim **5**, further comprising receiving the requested configuration data for the subscriber from the subscriber configuration network node.

8. The method of claim **7**, wherein the received access request is received from a client device in the network, and wherein the method further comprises transmitting, to the client device, the configuration data for the subscriber received from the subscriber configuration network node.

9. The method of claim **1**, wherein the received access request comprises a public user identity for the subscriber and a private user identity for the subscriber, and wherein the access request is associated with a Session Initiation Protocol (SIP) flow.

10. The method of claim **1**, wherein the received access request comprises a private user identity for the subscriber, but not a public user identity for the subscriber, and wherein the received access request is associated with a Traversal Using Relay Network Address Translation (TURN) flow.

11. The method of claim **1**, wherein the telecommunications network comprises an Internet Protocol Multimedia System (IMS) network and the subscriber configuration network node comprises a Home Subscriber Server (HSS).

12. The method of claim **11**, wherein the transmitted authorization request is transmitted to an Internet Protocol Multimedia Subsystem (IMS) Cx interface of the separate network node, and/or wherein the successful authentication response is received via the Internet Protocol Multimedia Subsystem (IMS) Cx interface of the separate network node.

13. The method of claim **1**, wherein the transmitted access request is received via a Hypertext Transfer Protocol (HTTP) interface of the separate network node.

14. The method of claim **13**, wherein the HTTP interface comprises a Representational State Transfer (REST)-ful HTTP Application Programming Interface (API).

15. The method of claim **1**, wherein the separate network node comprises:

a first Representational State Transfer (REST)-ful HTTP Application Programming Interface (API) configured to accept a first type of access request comprising a public user identity and a private user identity for a given subscriber; and

a second Representational State Transfer (REST)-ful HTTP Application Programming Interface (API) configured to accept a second type of access request comprising a public user identity, but not a private user identity for a given subscriber.

16. The method of claim **1**, wherein the network comprises a cluster of network nodes responsible for conducting registration procedures for subscriber devices and/or processing routing data relating to communication sessions conducted in the network, and wherein the access request is received from a network node in the cluster of network nodes.

17. An apparatus for use in constructing authorization requests in a telecommunications network, the network comprising:

a subscriber configuration network node configured to store subscriber configuration data for a plurality of subscriber devices; and

a user identity database configured to store user identity data for identifying subscribers in the network,

the apparatus comprising a network node separate from the subscriber configuration network node, the apparatus comprising at least one processor, and at least one memory including computer program code, the at least one memory and the computer program code being configured to, with the at least one processor, cause the apparatus at least to:

receive, at the network node separate from the subscriber configuration network node, a request to access configuration data associated with a subscriber from the subscriber configuration network node;

in response to the received access request comprising a private user identity for the subscriber, but not a public user identity for the subscriber:

retrieve, at the network node separate from the subscriber configuration network node, from the user identity database, a public user identity for the subscriber, the retrieval being carried out on the basis of the private user identity for the subscriber comprised in the received access request, wherein the user identity database is separate from the subscriber configuration network node; and

transmit, at the network node separate from the subscriber configuration network node, an authorization request to the subscriber configuration network node comprising the public user identity retrieved from the user identity database and the private user identity comprised in the received access request.

18. A computer program product comprising a non-transitory computer-readable storage medium having computer readable instructions stored thereon, the computer readable instructions being executable by a computerized device to cause the computerized device to perform a method for constructing authorization requests in a telecommunications network, the network comprising:

a subscriber configuration network node configured to store subscriber configuration data for a plurality of subscriber devices; and

a user identity database configured to store user identity data for identifying subscribers in the network,

the method comprising:

receiving, at a network node separate from the subscriber configuration network node, a request to access configuration data associated with a subscriber from the subscriber configuration network node;

in response to the received access request comprising a private user identity for the subscriber, but not a public user identity for the subscriber:

retrieving, at the network node separate from the subscriber configuration network node, from the user identity database, a public user identity for the subscriber, the retrieval being carried out on the basis of the private user identity for the subscriber comprised in the received access request, wherein the user identity database is separate from the subscriber configuration network node; and

transmitting, at the network node separate from the subscriber configuration network node, an authorization request to the subscriber configuration network node comprising the public user identity retrieved from the user identity database and the private user identity comprised in the received access request.

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